Southern California Edison

California Public Utilities Commission
R.01-10-024
Workshop
Value at Risk, Cash Flow at Risk
And Other Measures of Portfolio Risk
April 23, 2003, 10:00 A.M.
State Civic Center Complex
455 Golden Gate Ave, San Francisco
Meeting Room 9

Outline

- Risk metric tools review
  - Parametric
  - Probabilistic
  - Statistical
- Risk model constraints
- Hybrid techniques
- Evolving methods
- Application of risk metrics
- Conclusion on use of risk tools
- A roadmap is necessary
- DWR contract cost allocation creates a wild card

Risk Metric Tools Overview

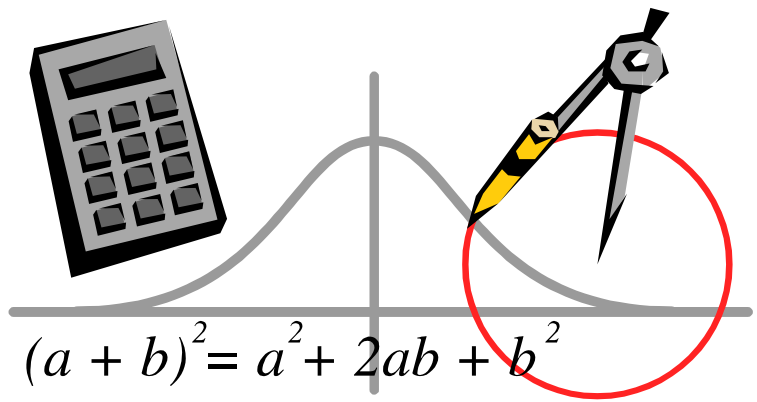
- For purposes of this presentation let's define a risk tool as a specific algorithm or series of calculations.
  - Example: calculating the median value of a distribution yields an expected value. The median is a risk tool. It can be used on its own or in combination with other tools.
- A risk model is a representation of some real world situation, or possible outcomes, by bundling a series of risk tools (algorithms) together.
- Most risk tools can be generalized into three major categories…
  - Parametric.
  - Probabilistic.
  - Statistical.

Risk Metric Tools Overview

- Parametric: equation based models based on constant parameters.
  - This is often referred to as "deterministic" because the certain inputs always produce the same output.
    - Each X yields only one Y. (Y = a + bX).
  - Parameters are often estimated through regression or simple statistics.
- For simplicity purposes the parametric tools do not include distributions or distribution characteristics like μ and σ.
- Types of parametric risk tools are.
  - Cost based engineering tools like…
    - ProSym, Aurora, unit dispatch models.
  - Financial valuation tools like…
    - DCF, IRR, MIRR, EVA, MVA, pro forma,

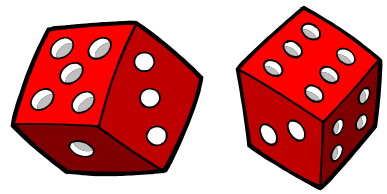
Risk Metric Tools Overview

- Probabilistic: tools that simulate outcomes based on probabilities drawn from specific distributions.
- These can use deterministic equations but may run distributions of X's to generate Y's.
- Types of probabilistic risk tools are.
  - Simulated VaR, CFaR, EaR,
    - options pricing (B-S), Greeks, linear-VaR.
  - Simulations such as…
    - Monte Carlo, stress testing.
  - Stochastic models such as…
    - Mean reversion, jump diffusion, drift models, etc.



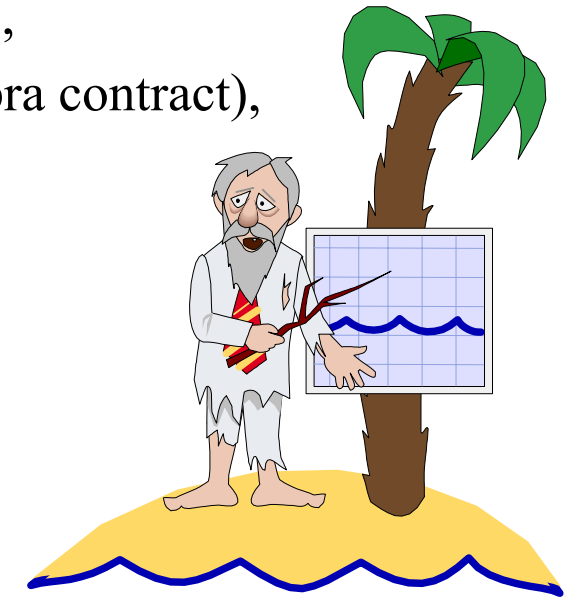
Risk Metric Tools Overview

- Statistical: numerical values, such as standard deviation or mean, that characterizes the sample or population from which it was derived. More sophisticated tools include regression based analysis.
- Types of statistical.
  - Moments
    - Mean, variance, skewness, kurtosis,
  - Simple statistics
    - Mode, median, coefficient of variation,
  - Regression tools like
    - OLS, frontier estimation, MLE, GLS, NLS.



Risk Model Constraints

- Modeling regulated operations with industry accepted risk metrics used in merchant wholesale businesses can be misleading.
- Types of idiosyncrasies that can produce misleading results…
  - Contract capacity factor requirements,
  - Emissions constraints,
  - Start up, ramp up/down, and shut down costs,
  - Delivery specifics (such as the CDWR-Sempra contract),
  - Exchange agreements.
- Testing existing contracts yielded valuations ranging from 20% to more than 200% difference between running the models with and without these constraints.



Risk Model Constraints

- Example of valuation with and without constraints.
- As contracts contain more optionality or increased constraints, risk metrics become more difficult to apply.
- Utility portfolios often contain large amounts of optionality and operating constraints.

	Energy Revenue ($)	Total Variable Costs ($)	Total Fixed Costs ($)	Total Value ($)
Contract X, Valuation With Constraints				
Annual				
2003	$10,517,364	$8,477,417	$1,439,664	$600,283
2004	$10,120,596	$8,377,263	$1,440,357	$302,976
Total	$20,637,960	$16,854,680	$2,880,021	$903,259
Contract X, Valuation Without Operating Constraints				
Annual				
2003	$15,190,541	$11,549,655	$1,710,000	$1,930,886
2004	$13,830,555	$10,600,410	$1,710,000	$1,520,145
Total	$29,021,096	$22,150,065	$3,420,000	$3,451,031
Constraint Differential				
2003	44%	36%	19%	222%
2004	37%	27%	19%	402%
Total	41%	31%	19%	282%

Risk Model Constraints

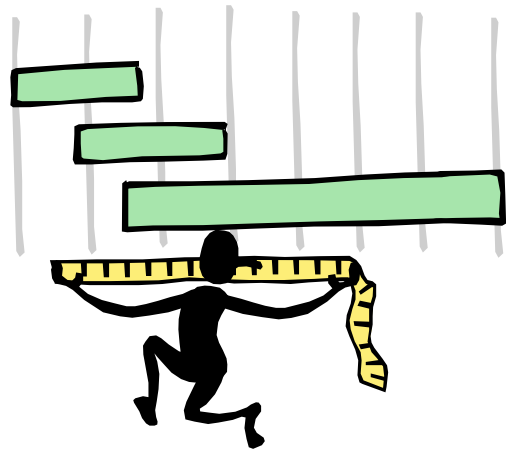
- User-defined input has a significant impact on results
  - Historical data encompasses a wide divergence of price and regulatory regimes
  - Market derived volatilities are dependent upon specific pricing models (e.g., Blacks vs. Black Scholes vs. etc.)
  - Bridging assumptions (e.g., Change in price caps, transition from market quotes to forecasts, etc.)
- Model sensitivity to inputs are difficult and/or not often measured
- Defining components of portfolio (e.g., DWR must-take gas requirements, QF costs, etc.)

Hybrid Techniques

- While many of these tools fall into the general categories discussed, most models will use multiple tools.
- For example certain components to VaR models can be generated using…
  - Simple statistics (variance, covariance),
  - Parametric equations with parameters estimated by regression,
  - Can use probabilistic tools such as simulation,
  - And so on.
- Most measures of risk, however, do not yield binary strategies (i.e. If x = true, then y).
- The real world is more complicated and so decisions are often made using a hybrid of models, tools, and judgment.

Evolving Methods

- Tools are constantly being morphed for improved applications and greater predictive values.
- Multiple models (using various techniques) can yield greater confidence when model results converge.
- SCE continues to explore risk metric tools and models and will adopt appropriate tools when reasonable.
- Because of the simplicity and sensitivity of certain tools, its difficult to rely exclusively on one metric for portfolio management.
- Risk tools instead are best used over time and as an additional input to be married with reasonable judgment.
- Utility procurement plans should provide sufficient flexibility with this regard

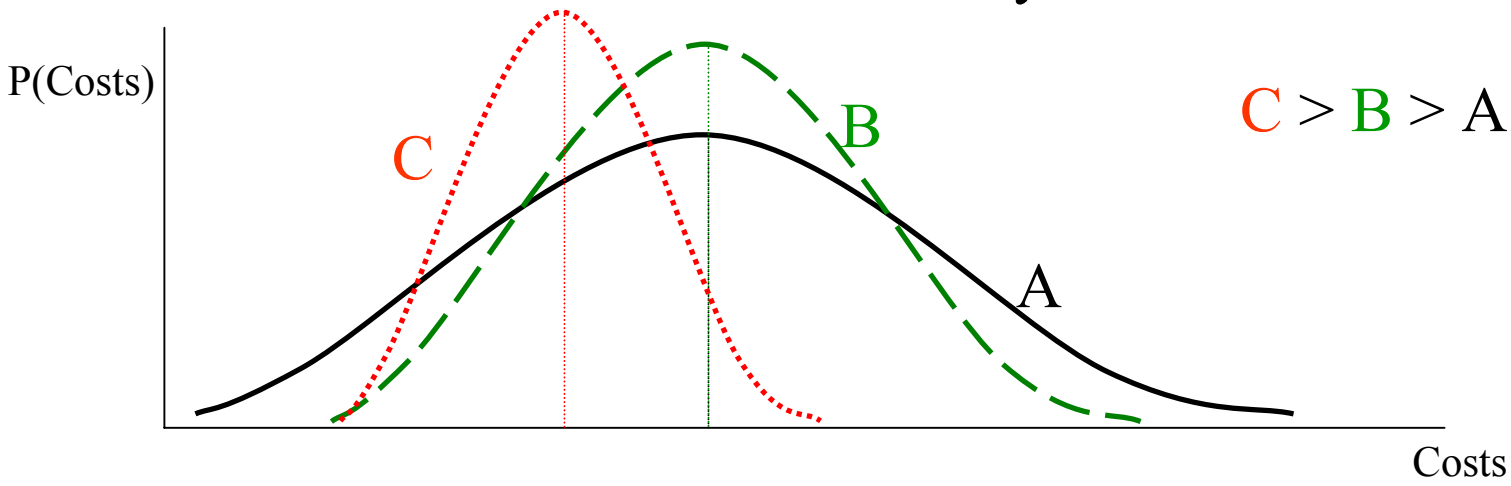


Application of Risk Metrics

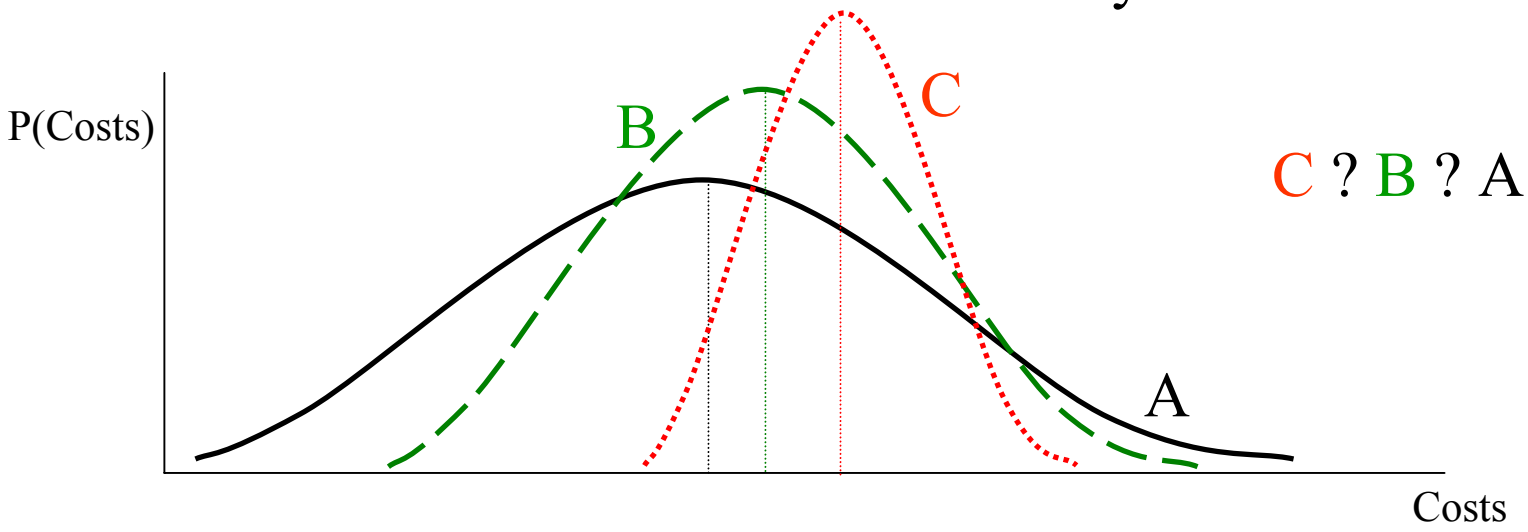
- So you have a risk metric. Now what?
- VaR, CFaR, etc., answers the question, "what is the maximum dollar amount at risk of devaluation, given a certain % probability within a certain time period?"
- So what's the right dollar amount to hedge to? $10 million, $50 million? What's the right % probability? 90%, 95%, 99%?
- In the case of VaR and CFaR, the models yield a distribution which can be helpful in framing the question.
- How do you make trade-offs between reducing variances and increasing expected costs?

Application of Risk Metrics

- These cost distribution choices are easy…



- These cost distribution choices are not easy



Conclusion On Use Of Risk Tools

- There are many risk tools and subsequent combinations of risk models.
- No one tool is clearly superior to all others.
- SCE is currently and will continue to research appropriate risk tools and models, and potential resulting risk metrics.
- It is an evolutionary process.
- Almost all risk metrics require an arbitrary decision of how to apply the metric.
- Risk model metrics are only one component of information necessary to make decisions.
- Risk metrics should be measured over time and used as guides; they should not be overly prescriptive and require pre-defined actions.

A Roadmap Is Required

- Procurement objective must be clearly established.
  - Portfolio risk tools and models must be compatible with the procurement objective.
- What is the procurement objective for utility procurement:
  - Mitigate procurement portfolio cost variance?
  - Meet a planning reserve requirement?
- A procurement portfolio cost variance reduction objective is not compatible with A requirement to procure planning reserves.
  - Cost variance reduction analysis may preclude the acquisition of planning reserves.

DWR Contract Cost Allocation Creates A Wild Card

- Utilities are charged with managing the risk associated with an integrated utility-DWR portfolio.
- Current cost allocation methodology allocates unavoidable DWR contract costs to all utility customers.
  - Allocation of costs associated with DWR contracts is interim.
  - How are the benefits/risks of hedging decisions related to the gas requirements for must-take energy allocated among all ratepayers?
- SCE analysis assumes that the commission will adopt A "cost follow contracts" allocation for life of the DWR contracts.
  - Dispatch of DWR contract energy may increase share of unavoidable contract costs.
- "Costs follow contracts" will eliminate unnecessary portfolio risk analysis and gas cost accounting complications.